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IMPACT ON RHEOLOGICAL PROPERTIES BY ADDITION OF FLEXIBLE NANOFIBERS

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Rheological properties of molten polymers containing a small amount of flexible nanofibers are investigated. In this experiment, poly(butylene terephthalate) PBT and polytetrafluoroethylene PTFE are employed as raw materials for the flexible fibers, and polypropylene PP and poly(lactic acid) PLA are used as matrix polymer melts. Further, the rheological properties are evaluated at the temperature below the melting points of the fibers. It is found that the addition of the nanofibers enhances melt elasticity greatly, such as primary normal stress difference and Barus effect, irrespective of the species of polymers. Moreover, the rheological response under uniaxial elongation is considerably affected by the fibers. In particular, drawdown force, the force required to stretch a molten strand, increases drastically. Furthermore, the strain-hardening bahavior in uniaxial elongational viscosity is clearly detected for the blends, which is not observed for a blend system containing rigid fibers such as glass fibers. Deformation of network comprising of the flexible nanofibers will be responsible for the anomalous rheological properties. Since shear viscosity is not changed to a great extent, the technique can be applicable to modify viscoelastic properties of a molten polymer.